HEALTH IMPROVEMENT IN THE LOWER MISSISSIPPI RIVER DELTA: OPPORTUNITIES AND CHALLENGES

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Key Messages

- The Lower Mississippi River Delta region is replete with challenges in virtually every area of social and societal development, including health, education, and economic conditions. The region lags substantially behind the rest of the nation in these major categories and has conditions that are similar to those in developing nations of Africa and Asia.
- These challenges are interconnected. Poor health status contributes to lower educational achievement and to stunted economic growth, and both limited education and poverty lead to poor health conditions.
- These deficits impact everyone in the region. In addition to directly affecting the humanistic and economic conditions of the sick, poor health reduces the economic development of the overall community through the macroeconomic effects of reducing worker productivity, community resources for nonhealth care needs, external investment, and educational achievement.
- Barriers to health improvement are significant and have resulted in limited success in the past. These barriers have included, among others, the complex nature of the problem itself, the interdisciplinary forces that impact health, the political complexities related to the intrastate issues, the multistate nature of the Delta, the longstanding historical and cultural factors, the lack of coordination among stakeholders, and the limited data on which to formulate evidence-based actions.
- Opportunities to promote health improvement lie in both community-oriented research and in public policy interventions. Successful research efforts must, if they are to be successful, focus on intermediate and primary as well as proximate health determinants, involve the community in planning and in execution, and include processes for dissemination of meaningful results to policy and decision makers and the research community.
- Public policy interventions have the potential for wide-spread improvement. They should promote intersectoral collaboration to target determinants of health, be evidence-based to maximize the opportunity to change outcomes, and focus on issues that predominantly affect the poor and other particularly disadvantaged population subgroups.
- One area of special need in improving health is promoting early childhood education. Early educational achievement impacts health as well as cognitive function and economic productivity later in life. Necessary efforts include assuring an adequate minimum level of prenatal care; providing parental training and support; providing quality child care; progressive introduction of basic education beginning in infancy; and requiring regular assessment of developmental milestones.

HEALTH IMPROVEMENT IN THE LOWER MISSISSIPPI RIVER DELTA: OPPORTUNITIES AND CHALLENGES

Executive Summary

The Mississippi River Delta region of the southern United States is an area replete with major challenges in virtually every area of social and economic development. These include some of the worst health and economic conditions in the nation, low educational attainment, and limited social cohesion aggravated by ongoing racial segregation and racism. The net result is a large region of the United States with many of the characteristics of an underdeveloped nation within the midst of the most highly developed and wealthiest country in the world.

Representative statistics illustrating the problems of the Delta include the following.

- Overall mortality rates in the Delta region are considerably higher than in the rest of the United States, with age-adjusted all-cause mortality rates that are 24% higher than in the nation.
- Trends in death rates in the Delta over the past decades demonstrate that the region lags national health outcomes by over 20 years and that the magnitude of the disparities between the Delta and the nation has increased.
- By 2004, the number of excess deaths in the Delta increased to roughly 18,000 individuals per year – equivalent to the loss of a moderate size Delta region community each year.
- In addition to poor overall health statistics, considerable racial disparities in health measures persist in the Delta. Mortality rates for African Americans in the Delta counties of Mississippi are 20% higher than for white Delta residents. The time-trends of mortality rates show that the racial differences in cardiovascular mortality is increasing.
- Of the ten states with the highest poverty rates and lowest income levels in 2004, six were Delta states, and 12 of the 25 lowest income counties in the nation were Delta counties.
- In 2000, 9.9% of Delta residents over the age of 25 years had fewer than 9 years of education, and, in 2004, Mississippi ranked 48th among the states in college education with only 20% of residents having a college degree.
- The low educational attainment in Mississippi accounts for an estimated 53% of the difference between the state's per capita income and that of the nation; in Arkansas, the low education level accounts for 69% of the difference between state and national per capita income.

Several concepts are central to the discussions that are presented. These include the concepts that:

- *health is a broad, multifactoral concept that includes social and behavioral well-being in addition to physical health;*
- *the heath conditions of a population are the net result of a complex series of personal, social, and societal determinants that must be addressed if change is to be successful and longstanding;*

- *health systems have multiple intrinsic goals, including meeting patients' realistic expectations, providing protection against financial distress due to illness, and assuring equity of care, in addition to improving health*;
- *the health and the economic conditions of a population are linked, with economic conditions impacting health and with health impacting economic development;*
- *education levels and health condition are interconnected, with changes in education affecting health and changes in health impacting educational achievement.*

Numerous challenges exist to improved health and related economic and educational conditions. These include:

- the focus on incremental, short term changes that may reflect the interests of specific stakeholders rather than the long-term needs of the entire community;
- lack of coordination and fragmentation of the efforts of the many government and private agencies, foundations, and academic institutions;
- the multistate nature of the region, with issues that span state borders but with planning and policy processes that are typically organized at a state level;
- the partial-state composition of the Delta, with the least healthy and poorest parts of states in the Delta, hindering appropriate attention to regional needs in state-wide planning;
- the history and culture of the region that is characterized by fatalism, personalism, and factionalism that impede change, and by persistent racism that leads to discrimination against individuals and regions like the Delta with high proportions of minorities; and
- the limited availability of health-related data on a regional level that are needed to assess the differences in demographic, socioeconomic, health status in parts of states that may differ substantially from each other and from the overall state conditions and to develop aggregate data for geographic units that cross state boundaries, such as the Delta.

Research and intervention strategies may be effective in understanding and improving the health conditions in the Delta. For these efforts to be successful, they should:

- *be evidence-based and developed about specific and testable hypotheses;*
- *reflect the multiple goals and objectives of the health care systems;*
- *emphasize the interrelationships among the proximate, intermediate, and primary health determinants and the interrelationships between health, economics, education, and other sectors;*
- *reflect the specific demographic, historical, and cultural features of the Delta that differ from other regions;*
- *include mechanisms for wide-spread dissemination of results to the range of interested stakeholders, including decision makers and community leaders, in addition to other investigators and the scientific community;*

- *span multiple disciplines and sectors, and involve a range of organizations including academic, governmental, private, etc., groups*.;
- *focus on population segments where impact and political interest are greatest, e.g., the poor and children;*
- *identify strategies to assure sustainability after the initial externally funded phase and assess scalability of pilot projects;*
- *include economic analyses including cost benefit analyses and macroeconomic assessments related to communal economic development and functions; and*
- *include an assessment process based on predetermined success factors and benchmarks.*

Public policies remain perhaps the most important approach to widespread improvement in health and economic development. Types of policies that may improve health conditions in the Delta include:

- *policies that alter the scope and emphasis of the overall policy program,* including promoting and mandating intersectoral policies and programs within the involvement of multiple governmental agencies and private organizations in a coordinated and comprehensive approach;
- *policies that promote sociostructural improvement,* including policies that address social and societal determinants of health in addition to health care and that recognize the social and societal factors that influence personal behaviors;
- *policies that focus on the disadvantaged*, including the poor, mothers and young children, and minorities, that is, policies that form a "pro-poor" policy approach that concentrate resources and focus attention on the conditions of the poor; and
- *policies that directly impact health care services,* including promoting access to effective care by programs to expand health professional manpower in underserved areas; improving quality of care; and reducing the financial burden of care and the financial consequences of illness by expanding public insurance and broad social support coverage.

Special attention is warranted to the critical role of early childhood education in promoting population health. Appropriately timed and targeted interventions have been shown to improve cognitive capacity of at-risk children at the pre-kindergarten level. Elements of an effective policy program aimed at improving educational achievement include assuring an adequate minimum level of prenatal care; providing parental training and support; providing quality child care; progressive introduction of basic education beginning in infancy; and requiring regular assessment of developmental milestones.

HEALTH AND ECONOMIC DEVELOPMENT IN THE LOWER MISSISSIPPI RIVER DELTA: OPPORTUNITIES AND CHALLENGES

The Mississippi River Delta region of the southern United States (Figure 1) is an area replete with challenges in virtually every area of social and economic development. These include some of the worst health and economic conditions in the nation, low educational attainment, and limited social cohesion aggravated by ongoing racial segregation and racism. The net result is a large region of the United States that has many of the characteristics of an underdeveloped nation within the midst of the otherwise most highly developed and wealthiest country in the world.

It is the purpose of this report[1] to:

- summarize the *basic concepts* underlying the interrelations between health and the determinants of health (Part I);
- summarize *current knowledge* about the health, economics, and educational attainment in the region (Part II);

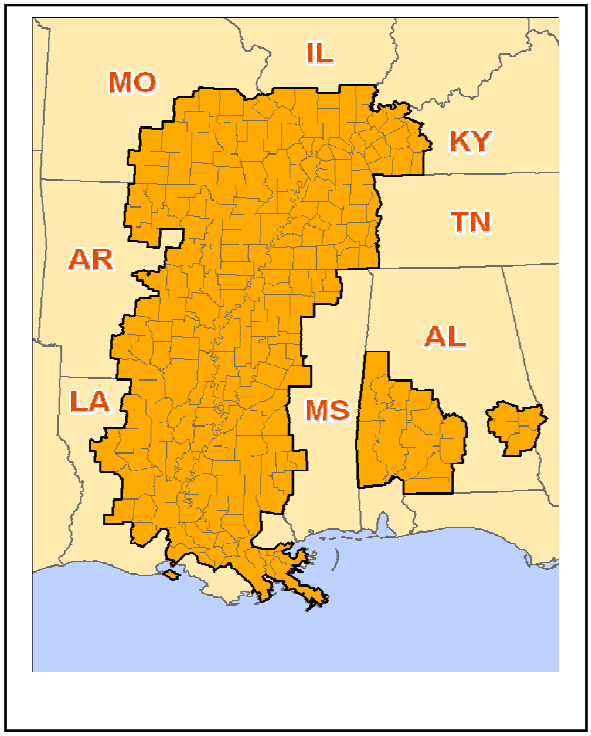

Figure 1: The Mississippi River Delta Region, as defined by the Delta Regional Authority. From www.dra.gov.

[1] This report is written as a broad overview of the topics presented. Hence, data, references, and technical information are limited. For additional information, please contact the authors.

- discuss some of the *barriers* that exist to health improvement in the region (Part III);
- examine the major short- and long-term *research and intervention opportunities* for further analysis and improvement of the issues facing the region (Part IV); and
- discuss the pivotal role of *public policy* interventions in improving the health of the region (Part V).

It is not the goal, however, to define in any detail a concrete, specific plan of action. Rather, it is the goal to lay out the background and the general principles upon which such specific agendas may be developed.

The information for this report comes from several sources. These include:

- a review of the existing, published literature on health and related issues in the Delta;
- a limited search of existing databases for information on the Delta;
- key informant interviews with public health leaders in the states of Arkansas, Mississippi, and Tennessee (listed in Appendix A); and
- discussions among members of the ongoing research collaborative of faculty of academic institutions (listed in Appendix B) with interests in understanding the factors that have lead to the current conditions in the Delta and in developing effective interventions to improve these conditions.

I. BASIC CONCEPTS

Several concepts are central to the discussions that follow. These include the concepts that:

- *health is a broad, multifactoral concept that includes social and behavioral well-being in addition to physical health;*
- *the heath conditions of a population are the net result of a complex series of personal, social, and societal determinants that must be addressed if change is to be successful and longstanding;*
- *health systems have multiple intrinsic goals, including meeting patients' realistic expectations, providing protection against financial distress due to illness, and assuring equity of care, in addition to improving health;*
- *the health and the economic conditions of a population are linked in many ways, with economic conditions impacting health and with health impacting economic development; and*

- *health conditions are also linked to education achievement, low education levels contributing to poor health and poor health limiting education achievement.*

A. HEALTH AS A MULTIFACTORAL CONCEPT

The World Health Organization (WHO) has defined health as:

> "a state of complete physical, mental, and social well-being and not merely the absence of disease, or infirmity".

This definition has several important implications for projects to improve health in the Delta:

- *assessing "health" requires attention to numerous social and behavioral outcomes as well as to physical functions; and*
- *efforts to improve health require attention to behavioral and social well being as well as to physical functions.*

B. THE MULTIFACTORAL DETERMINANTS OF HEALTH

Health of a population is determined by the interaction of many forces within a community, including personal, social, and societal factors. Successful interventions improve health and economic conditions by acting through these determinants. If they are not addressed, interventions may address only symptoms rather than causes and will be unlikely to lead to long-term improvement.

The determinants of health may be grouped as *primary, intermediate, and* proximate causes, as depicted in Figure 2.

- *Proximate* causes are those factors most directly related to health, including medical care, personal health habits, family history, and environmental factors.
- *Intermediate causes* directly impact the proximate causes and include, as examples, levels of education and poverty, and the characteristics of health care systems.
- *Primary factors* are basic social and political forces that represent underlying, basic factors that determine other, downstream health influences.

This multi-layered model of the determinants of health suggests several important findings and implications.

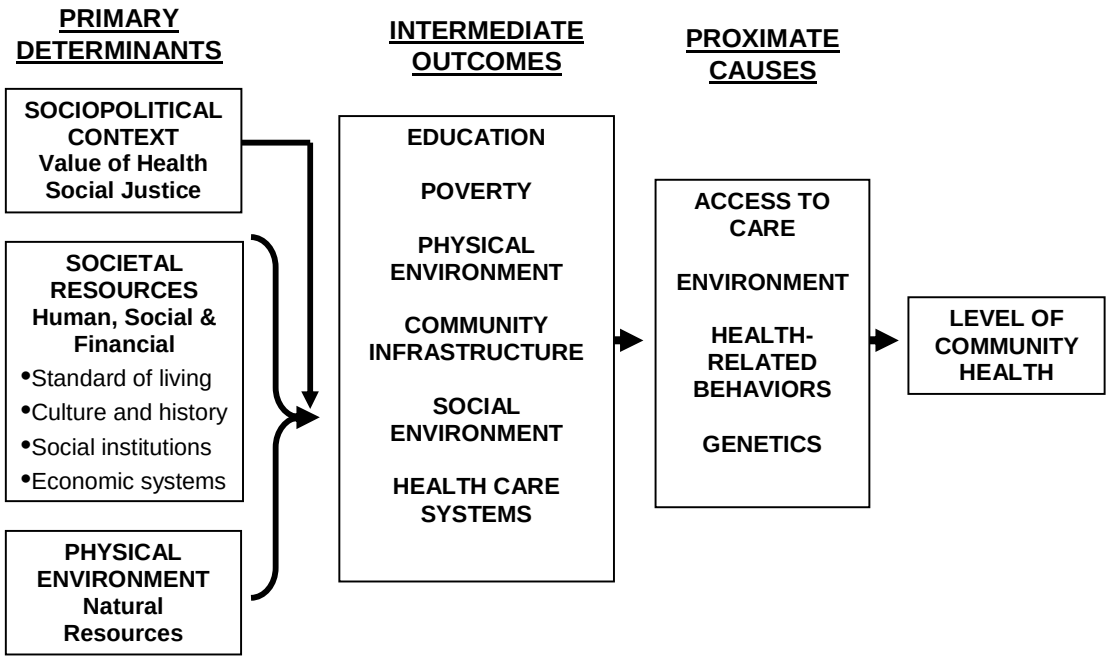

Figure 2: Proximate, intermediate, and primary determinants of health.

- *Personal medical care has a limited impact on health.* Medical care may account for as little as 10% of overall health status.[2] In contrast, personal behaviors account for up to 50% of health conditions.
- *Improving health requires interdisciplinary efforts*, involving social sciences as well as biomedical interventions, and considering factors such as culture, education, religious institutions, housing, transportation, local businesses, and government.
- *Each of the proximate causes can be related to one or, more often, multiple predisposing intermediate or primary factors.* For example, unhealthy behaviors may be related to low education levels or to unsafe neighborhoods that limit outdoor physical activity. Low educational levels of particular groups may, in turn, reflect a fundamental lack of social justice and equity that may be manifest as detrimental tax, labor, or environmental policies.
- *Because outcomes are dependent upon greater than one determinant, interventions that impact single determinants may not be effective in improving final outcomes.*
- *Similarly, a change, for the better or for the worse, in a primary or intermediate determinant can impact more than one proximate determinant of health status.*

[2] Schroeder SA. We can do better – improving the health of the American people. N Engl J Med 357:1221, 2007.

- *Efforts to improve equity in health must address equity in the underlying determinants of health and equity in access to health care.*[3]
- *The health of individuals is dependent upon personal as well as community resources and abilities.* For example, an individuals access to medical care is dependent both upon his or her own insurance coverage in addition to the prevalence of lack of insurance in the community.[4]
- *The multiple determinants cross the purview of many different governmental and private agencies.* Thus, health improvement efforts such as state health plans must, likewise, be coordinated among numerous agencies and organizations including government departments responsible for education, business development, urban planning, etc. No single sector can achieve success alone.[5]
- *The model suggests the concept of "victims" and "sinners".*[6] As noted above, personal behaviors (and conditions caused by these behaviors) are among the largest contributors to illness.[7] Is the responsibility for these unhealthy behaviors totally in the hands of the individual, that is, are they "sinners"? Or, are there social and societal factors that predispose these individuals to these behaviors, that is, are they "victims"? This distinction is important in developing public policy interventions to improve health; the public at large is considerably less supportive of initiatives aimed at "sinners" who arguably bear the personal blame and responsibility than for initiatives targeting "victims".
- *The model relates to what has been called the "fundamental cause theorem".*[8] According to this model, the primary causes of poor health place disadvantaged groups at risk regardless of the specific health threats that exists. The poor have, over centuries, born the brunt of diseases ranging from the plague to obesity. Unless the primary causes are ameliorated, addressing the disparities in specific diseases will not result in long term disparity reductions; only addressing the basic, primary causes will.

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[3] Daniels N. *Just Health. Meeting Health Needs Fairly*. New York: Cambridge University Press, 2008.
[4] Davidson PL, Andersen RM, Wyn R, Brown ER. A framework for evaluating safety-net and other community-level factors on access to care for low-income populations. Inquiry 41:21, 2004.
[5] State health plans of several states, e.g., Minnesota, include assignments and responsibilities for multiple state agencies and departments.
[6] Mechanic D, Tanner J. Vulnerable people, groups, and populations: social view. Health Aff 26(1):1220, 2007.
[7] Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States. JAMA 291:1238, 2004.
[8] Phelan JC, Link BG, Diez-Roux A, Kawachi I, Levin B. Fundamental causes of social inequalities in mortality: a test of the theory. Soc Sci Med 45, 265, 2004.

C. THE MULTIPLE FUNCTIONS OF A HEALTH CARE SYSTEM

The WHO has identified three intrinsic goals of a health care system.[9] These include:

- *improving the health outcomes of the population;*
- *meeting the realistic expectations of the population;*
- *providing protection against financial ruin caused by illness*; and
- *meeting all of these objectives across the total population with equity*.

The U.S. Surgeon General's report has added reducing health care disparities to improving health status as the two national health goals.[10]

This broad view of the functions of a health care system has the substantial implications:

- *multiple outcomes must be included in an assessment of the adequacy of a health care system*, whether at the international, national, or regional level;
- *health care system improvement may focus on any or all of these factors*; and
- *improvement will require the involvement of multiple governmental and private organizations* with spheres of influence and expertise that cover all of the required functions.

D. THE INTERRELATIONSHIPS BETWEEN HEALTH AND ECONOMIC DEVELOPMENT

Economic conditions impact health and health status impacts economic conditions. And each of these is linked to other personal, social, and societal factors. As depicted in Figure 3, health and economic interactions occur in the broader context of public policy, history, and culture.

Thus, improving health and improving economic conditions are linked. The relationships between these two conditions will be presented in some detail and emphasized later in this report because of their profound implications, many of which are commonly underappreciated.

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[9] World Health Organization. *The World Health Report 2000 – Health Systems: Improving Performance. Geneva:* The World Health Organization, 2000.

[10] U.S. Department of Health and Human Services. *Healthy People 2010*, 2nd ed. Washington, DC: U.S. Government Printing Office, 2000.

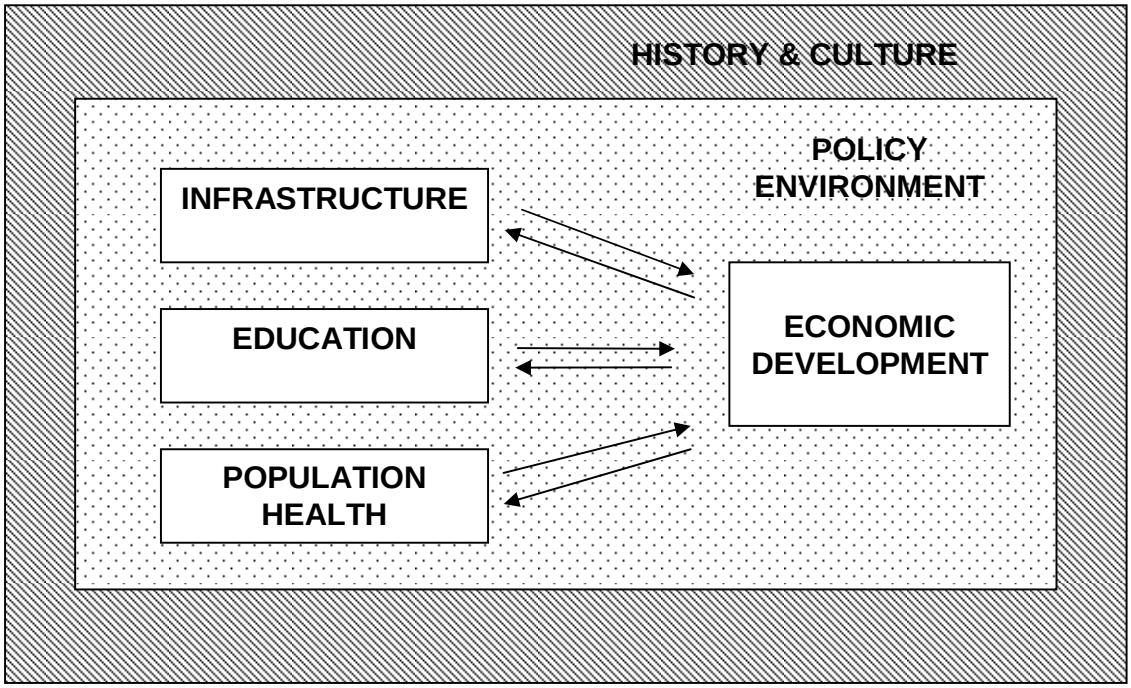

Figure 3: The interrelations between health and economic development, in the context of policy, history, and culture.

Health as a Function of Wealth. The direct relation between income and health has been documented at the international and national levels. Across nations, wealthier nations exhibit better population health.[11] Within nations, including the United States, people with higher incomes have, on average, better health outcomes than do less affluent persons.

Two major paths lead to these results:[12]

- *persons with higher incomes have greater access to material factors that promote health*, including access to health care and health promoting services, less exposure to environmental health hazards, and greater ability to develop better health behaviors; and
- *lower socioeconomic conditions lead to psychological vulnerabilities*, including lack of social participation[13] and altered future time perspective, each of which is associated with reduced health status.

The relative role of these two factors may differ in more and in less developed nations or regions. Psychosocial factors may be more important than the material ones in more developed societies. In these societies, many of the

[11] Preston S. The changing relationship between mortality and the level of economic development. Pop Studies 29:21, 1975.
[12] Marmot M. The influence of income on health: views of an epidemiologist. Health Aff 21(2):31, 2002.
[13] Data suggest that the socially isolated have two to five times the overall mortality rate of those with better social connections.

material factors that influence health, such as basic sanitation, are available even among the poorest groups. Hence, the interventions aimed at improving health among the poor in undeveloped and developed nations (or regions of a nation) may differ. [14]

Wealth as a Function of Health. The relationships between wealth and health may also be examined in the opposite direction, that is, improved health spurs increases in wealth. In this paradigm, health is an *'economic engine'*. Although these connections have been known for many years, their importance has recently been emphasized by, for example, the WHO[15], and the role of health has been incorporated into the economic development objectives of the World Bank and the International Monetary Fund. The mechanisms for this linkage have been reviewed in detail elsewhere[16,17] and include impacts on personal and family income, business productivity, and national or regional macroeconomic forces.

At an individual or family level, the duration and quality of life directly impact a person's ability to generate personal income. According to the World Health Organization, illness or death is the main cause of new or increasing poverty in the world.[18] Health improvements that extend life may result in an increase in working years and, thereby, prolong the duration of economic productivity. Interventions that enhance the quality of life may raise the economic output of each year of life, that is, they increase productivity by reducing both missing work (or *absenteeism*) and reducing lost labor productivity while at work (or *presenteeism*). Improvements in survival and health in the U.S. from 1970 to 1999 increased the value of the output of the formal labor force by as much as 8%.[19]

In addition to the impact of personal health to personal or family finances, improved health of the overall population has substantial aggregate or macroeconomic effects. These effects, although less commonly appreciated than the personal consequences, are large in magnitude, and they impact everyone in a community – not just those who are ill.

Improved population health promotes macroeconomic development by:

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[14] It is clear, however, that economic barriers to basic services, such as basic health care, do exist among the poor in developed nations. This will be considered below.
[15] Commission on Macroeconomics and Health. *Macroeconomics and Health: Investing in Health for Economic Development.* Geneva: World Health Organization, 2003.
[16] Bloom DE, Canning D. The health and wealth of nations. Science 287:1207, 2000.
[17] Mirvis DM, Chang CF, Cosby AG. Health as an economic engine: evidence for the importance of health in economic development. J Health Human Serv Admin 31:30, 2008.
[18] World Bank. *Voices of the Poor.* Washington, DC: The World Bank, 2006.
[19] Battacharya J, Lakdawalla DN. *The Labor Market Value of Health Improvement*. Forum for Economic Policy, Article 2, 2005.

- *increasing savings* that provide financial capital for investment, as healthier people with greater longevity are more concerned with future financial needs;[20]
- *requiring a smaller proportion of available funds for current health care*, making more funds available for savings, investment, and other needed infrastructure projects;
- *encouraging outside investment*, as poor health conditions raise concerns about the capability of the local workforce to meet the needs of outside investors;[21]
- *facilitating education,* as healthier children are better prepared for school, stay in school longer, miss fewer days of school, and learn more when in school; and
- *reducing birth rates,* as lower childhood death rates reduce the perceived need for families to have more children to compensate for higher infant mortality rates, with a resulting increase in parental investment per child in, for example, education. [22]

The magnitude of these impacts of population health on economic development is substantial. For businesses, the productivity losses of illness exceed the direct medical care costs by a substantial margin. Workers with depression have an average of 5.6 lost hours of productive work per week, with an annual cost to employers of $44 billion per year.[23] Pain results in the loss of over $61 billion per year.[24] In each case, over three-fourths of the lost productivity is related to presenteeism.

At the macroeconomic level, historical studies have concluded that half of the overall economic growth in the United States during the last century can be attributed to improvements in health.[25] It has been estimated that the increase in longevity between 1970 and 2000 added $3.2 trillion per year to the national wealth, after accounting for the increase in health care costs during that period. [26]

Health as Human Capital and as an Investment. A major implication of this 'health as an economic engine' paradigm is that population health is a major

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[20] Bloom DE, Canning D, Graham B. Longevity and life-cycle savings. Scan J Econ 105:319, 2003.
[21] Alsan M, Bloom DE, Canning D. The effect of population health on foreign direct investment inflows to low- and middle-income countries. World Development 34:613, 2005.
[22] Bloom DE, Williamson J. Demographic transitions and economic miracles in emerging Asia. World Bank Economic Review 12:419, 1998.
[23] Stewart, WF, Ricci JA, Chee E, Morganstern D, Lipton R. Lost productive time and cost due to common pain conditions in the US workforce. JAMA 290:2443, 2003.
[24] Stewart, WF, Ricci JA, Chee E, Hahn SR, Morganstern D. Cost of lost productive work time among US workers with depression. JAMA 289:3135, 2003.
[25] Nordhaus WD. *The Health of Nations: The Contribution of Improved Health to Living Standards.* Cambridge, MA: The National Bureau of Economic Research, Working Paper #8818, 2002.
[26] Murphy KM, Topol RH. *The Value of Health and Longevity*. Cambridge, MA: The National Bureau of Economic Research, Working Paper #11405, 2002.

contributor of *human capital* in the form of *health capital*. The Institute of Medicine[27] defines health capital as "the present value of the stock of health a person is expected to have over the course of his or her lifetime." The large economic impact of health places health as an important source of human capital equal to that of education and on-the-job training, the two other components of human capital most often considered.

Because health is a form of capital, the costs of improving health are investments, and they are similar to other investments made by businesses or governments to build industrial or public infrastructure. The rate of return on these investments is high. Realistic improvements in prevention and treatment for common chronic conditions can add up to $5.7 trillion (in 2003 dollars) annually to the U.S. economy by 2050.[28] A 10% reduction in heart disease mortality is estimated to be worth over $4 trillion and a 1% reduction in cancer death is estimated to be worth over $400 billion to current and future generations.[29] New treatments for low birth weight infants developed between 1950 and 1990 add $40,000 of health care costs for each case, whereas the present value of the resulting 12 year increase in longevity is estimated to be $240,000 per case - for a 6 to 1 return on the investment.[30] Detrimental behaviors, similarly, have high economic costs; the overall economic cost of cigarette smoking may be as high as $222 per pack.[31]

Impacts on Children and the Poor. Health gains in childhood and among the poor – two groups particularly relevant to health and economic growth in the Delta – represent the greatest opportunity for additional economic growth based on improved health. Deaths in childhood or young adulthood, before individuals enter the economic markets as productive workers, represent large economic losses as the returns on investments in education and development are forgone. This impact has been recognized as far back as 1842 when Edwin Chadwick argued for more spending on sanitation because it would reduce the economic loss created by the early death of poor children.

Poor infant and childhood health also leads to deleterious health[32] and economic consequences later in life. Common childhood conditions such as severe iron deficiency anemia, hypertension, poorly controlled diabetes mellitus, and low birth weight are associated with reduced educational achievement that, in turn, is associated with reduced labor productivity. One additional year of

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[27] Institute of Medicine. *Hidden Costs, Lost Values.* Washington, DC: National Academies Press, 2003.
[28] DeVol R, Bedroussian A. *An Unhealthy America: The Economic Burden of Chronic Disease.* Santa Monica, CA: The Milken Institute; 2007.
[29] Murphy K, Topel R. Diminishing returns? The costs and benefits of improving health. Perspec Biol Med 46:S108, 2003.
[30] Cutler DM, McClellan M. Is technological change in medicine worth it? *Health Aff* 20(5):11, 2001.
[31] Viscusi K, Hersch J. *The Mortality Cost to Smokers.* Cambridge, MA: National Bureau of Economic Research, Working Paper #13599, 2007.
[32] Gluckman PD, Hanson MA, Cooper C, Thornburg KJ. Effect of in utero and early-life conditions on adult health and disease. N Engl J Med 359: 61, 2008.

education, as may result from improved health status, leads to a 15% higher starting wage and a doubling of the rate of subsequent salary increases.[33]

A second group for which health improvement efforts may substantially increase economic growth is the poor. They have the highest disease burden and are less likely to have the resources to improve their health; they are caught in a health-poverty trap from which it is difficult to escape. The poor are more dependent upon physical labor for income and, hence, are more economically dependent upon health.[34] In addition, the poor typically lack political influence and depend on others to promote their well-being through public policy.[35] As noted by Angus Deaton, "when low income and poor health go together, the poor are doubly deprived and thus have a greater claim on our attention than is warranted from their incomes alone."[36] Recognizing these basic aspects of poverty, the WHO has promoted a "pro-poor" approach to improving health[37] in which even modest investments in health improvement can lead to large economic gains.

Virtuous Cycles and Traps. A final point is that this role of health as an economic engine extends rather than supplants the conventional role of economic development as a precursor to improved health. The two models interact to result in either a 'health-poverty trap' or a 'virtuous cycle'. On one hand, poor health limits economic growth that, in turn, prevents improvements in health. The net result is a 'trap' that is difficult to escape. On the other hand, improved health contributes to greater economic development, with the resulting increase in wealth contributing to a further increase in health that leads, *parri passu*, to more economic development, etc., to produce a 'virtuous cycle'.

One implication of this cyclical model is that one may start with either a primary health or a primary economic intervention and expect the other to follow. One might also intervene to strengthen the connections between health and economics, as shown in Figure 3. The success of an economic intervention may, however, be dependent upon the health of the population, as an unhealthy workforce may be unable to support the needs of an economic industrial stimulus. As described by Nobel Prize winning economist Theodore Schultz, investment in infrastructure not balanced by investment in human capital, means that "human capabilities do not stay abreast of physical capital, and they become limiting factors in economic growth."[38]

It is also important to note that improving health alone cannot be expected to lead to economic growth. Other factors must also be present, e.g., jobs must

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[33] Sala-i-Martin X. On the health-poverty trap. In*: Health and Economic Growth. Findings and Policy Implications.* G Lopez-Cassasnovas, B Rivera, and L Currais, eds. Cambridge, MA: MIT Press, 2005.
[34] Mechanic, D. Disadvantage, inequality, and social policy. Health Aff 21(2):48, 2002.
[35] Galbraith JK. *The Culture of Contentment.* Boston: Houghton Mifflin, 1992.
[36] Deaton A. Policy implications of the gradient of health and wealth. Health Aff 21(4):13, 2002.
[37] Organisation for Economic Co-operation and Development and the World Health. *Poverty and Health.* Geneva: World Health Organization, 2003.
[38] Schultz TW. Investment in human capital. Am Econ Rev 5:1, 1961.

be available for those now able to work because of better health. Rather, improving health may be a necessary condition for development although not a sufficient one.

Thus, poor health conditions are connected and linked to other social and societal problems. These connections have been summarized by Gnuschke *et. al.*[39] as follows:

> "It is difficult to separate the demographic, social, and economic changes that have occurred in the Delta. The complex fabric that forms the Delta cannot be broken into parts for simple analysis. Health care issues cannot be separated from economic issues, and neither of these issues can be separated from social, political, and other factors of race and power that form the fabric of the Delta….The clear interaction of health and economic data cannot be overstated and neither can the relationships between education, productivity, employment, income, and social progress. Health is one aspect of investing in human capital and, like education, has its support in the basic mix of public and private goods. Social goods require social investments, and public safety, education, and health are frequent exceptions to the rules of the marketplace."

These concepts have several important implications for health improvement in the Delta, including:

- *emphasizing the importance of direct support of health improvement efforts, in addition to direct investments in economic development that may secondarily enhance health, on health improvement;*
- *recognizing that health expenditures are sound economic investments rather than simply expenditures on consumption goods; and*
- *including plans to improve population health as intrinsic parts of economic development plans.*

E. THE INTERRELATIONSHIPS BETWEEN HEALTH AND EDUCATION

The relationship between education and health is, as in the relationship between health and economic development, both powerful and bidirectional. That is, poor health inhibits educational attainment and low educational achievement leads to poor health.

Poor health limits educational opportunity and achievement, as discussed above. Unhealthy children attend school for fewer years, miss more school, and learn less while in school.[40] This, in turn, translates to lower economic productivity later in life as noted above.

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[39] Gnuschke JE, Hyland S, Wallace J, Hanson R, Smith S. Still a long way to go for the Lower Mississippi Delta. J Health Hum Serv Admin 31:72, 2008.

[40] Jamison DT, Leslie H. Health and nutrition considerations in education planning: the cost and effectiveness of school based interventions. Food Nutrition Bulletin 12:204, 1990.

The impacts of education on health are also very strong.[41] Better educated children and adults are healthier, have lower rates of mortality and morbidity, and spend less on health care than do less educated people. As one example, Medicaid recipients with the lowest level of literacy spend five times as much on health care as the overall Medicaid population.

This impact may occur through several paths. These include the impacts of education on work and economic conditions, on social and psychological resources, and on life-style and health behaviors all of which affect personal health. Thus, better educated people are more likely than others to have full time, high paying, and safe jobs; to have more supportive and informative social connections; and exhibit more health promoting behaviors related to diet, exercise, and access to health care.

The relationship between education and economic development is also clear. Adults with less than a high school degree are 3.9 times as likely to be unemployed as are college graduates and only one-fourth as likely to have retirement accounts. Growth in average family income for families whose head had only one to three years of high school education fell by 25% between 1973 and 2004; for families with a college degree, the average income rose by 17%. The low educational attainment in Mississippi accounts for an estimated 53% of the difference in the state's per capita income;[42] in Arkansas, the low education level accounts for 69% of the difference between state and national per capita income.[43] According to Mississippi Governor Haley Barbour, "Education is the number one economic development issue and the number one quality of life issue in out state…"[44]

Early childhood education may have the greatest impact on health and on later economic productivity. Learning starts at birth, and neural paths related to cognitive function are significantly affected by early childhood experiences. Education of current and future parents is likewise critical; there is a good relation between the educational level of parents and the subsequent literacy and mathematics skills of their children. However, various interventions have been successful in mitigating the impact of poor parental education – a concept particularly important in regions such as the Delta in which adult literacy and poverty are multigenerational. As noted by Low, *et al*., "being born at risk does not have to be a life sentence for our children."[45]

These relationships have significant implications for efforts to improve health in the Delta, including:

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[41] Low MD, Low BJ, Baumler ER, Huynh PT. Can education policy be health policy? Implications of research on the social determinants of health. J Health Polit Pol Law 30:1131, 2005.
[42] Southern Education Foundation, *op. cit*.
[43] Southern Education Foundation. *Miles to Go - Arkansas.* Atlanta, GA: Southern Education Foundation, 2008.
[44] Southern Education Foundation. *Mile to Go - Mississippi.* Atlanta, GA: Southern Education Foundation, 2008.
[45] Low, *et al*., *op.cit.*

- *recognizing that interventions to improve educational attainment, particularly in early childhood, are important if not critical parts of overall strategies targeting health;*
- *emphasizing the need to evaluate the impacts of changes in education policies on health and on education; and*
- *supporting the importance of incorporating the economic consequences of the changes in health that result from changes in education, as well as the direct economic impacts of education, in assessing the cost-benefit relationships of educational investment.*

II. HEALTH, ECONOMIC, AND EDUCATION CONDITIONS IN THE DELTA

A. DEMOGRPAHICS OF THE DELTA

Selected demographic features of the Delta and of the entire U.S. that impact the health and health care are listed in Table I. These data demonstrate, among the many findings, that:

- the population of the Delta declined by 2.4% during the two year period from 2004 to 2006, while the national population grew;
- the Delta has a substantially higher proportion of African Americans and a lower proportion of Hispanics than the rest of the nation;
- the age distribution in the Delta is similar to that of the U.S.;
- the population in the Delta is more rural than in the nation; and

Table I: Demographic Features of the Delta

Measure	Year	Delta	U.S.
Total Population	2006	9,254,104.00	303,326,260.00
Total Population	2004	9,477,475.00	297,550,259.00
% Population - Male	2004	48.54%	49.20%
% Population - White	2004	63.41%	66.49%
% Population - African American	2004	32.47%	12.60%
% Population - Hispanic	2004	1.96%	12.84%
% Population - Under 5 Years	2004	5.38%	5.38%
% Population - 65 Years or Older	2004	12.66%	12.20%
% Population - Urban	2004	60.60%	79.30%
% Births To Teen Mothers	2001-3	20.65%	3.68%
% Births To Unmarried Mothers	2001-3	63.59%	34.30%

Source: the authors' analysis of the Area Resource File, 2006 Edition.

- a substantially higher proportion of births in the Delta are to teenage and to unmarried mothers than in the overall nation.

These data suggest that, based on current demographics and trends, improving health in the Delta will face challenges that are different from efforts in other regions of the nation.

B. HEALTH IN THE DELTA

The Delta has had a long history of poor health outcomes compared to the rest of the nation. The region is one of the three most "unhealthy places" in the United States, along with Appalachia and the so-called "Black Belt" that extends across Virginia, North Carolina, South Carolina, Georgia, and Alabama.[46] Low income rural Blacks in adjacent parts of multiple states in the Mississippi Valley and the Deep South have an average life expectancy at birth (for men) of 67.7 years, compared to 82.8 years for the healthiest population group in the nation – a gap exceeding that between Iceland (with the longest male life expectancy) and Bangladesh.[47]

Information about health status in the Delta has been recently summarized by Dr. Arthur Cosby and his associates at Mississippi State University.[48] Major findings include the following.

- *Overall mortality rates in the Delta region are considerably higher than in the rest of the United States (Table II).* The age-adjusted, all-cause mortality rate in 2004 was 987.5 per 100,000 population in the region, compared to 794.5 per 100,000 population for the U.S.
- *The disparity of 193 more deaths per 100,000 people per year in the Delta region than in the nation accounts for approximately 20% of all deaths in the region.* A person in the Delta region is 24% more likely to die than a person in the rest of the U.S.
- *These higher mortality disparities also hold for the major causes of death*, ranging from 16% greater for cancer to 45% greater for deaths due to injury (Table II).
- *Common risk factors for disease are also more prevalent in the Delta than in the nation.* A resident of the Delta region has a greater likelihood of being obese, is 23% more likely to have high blood pressure, is 41% more likely to report diabetes, and is 13% more likely to report smoking than an average U.S. resident.

[46] Cossman RE, Cossman JS, Jackson-Belli R, Cosby AG. Mapping high or low mortality places across time in the United States. Health Place. 9:361, 2003.
[47] Murray CJ, Kulkarni S, Ezzati M, *et al*. Eight Americas: new perspectives on U.S. health disparities. Am J Prev Med 29(Suppl. 1):S4, 2005.
[48] Cosby AG, Bowser DM. The health of the Delta region: a story of increasing disparities. J Health Hum Serv Admin 31:58, 2008.

Table II: Mortality Rates from Common Diseases in the Delta and in the U.S.

	Morality Rate[a]			Simple
Cause of Death	Delta	U.S.[b]	Difference	Odds Ratio
Cardiovascular	275.0	214.7	60.3	1.28
Cancer	220.0	189.5	30.5	1.16
Stroke	78.7	63.0	15.8	1.25
Injury	54.0	37.2	16.8	1.45
Diabetes	33.8	24.2	9.6	1.39
All Causes	987.5	794.5	193.0	1.24

a Deaths per 100,000 population.

b Rates in all U.S. counties excluding the 240 Delta counties.

From Cosby AG, Bowser DM. The health of the Delta region: a story of increasing disparities. J Health Hum Serv Admin 31:58, 2008.

- *Other measures of overall population health are substantially worse than in the nation.* For example, 10.4% of Delta births yielded low birth weight and 2.1% yielded very low birth weight babies, compared to the national figures of 7.8% and 1.4%, respectively.[49]
- *Trends in death rates in the Delta over the past decades (Figure 4) demonstrate that the region lags national health outcomes by over 20 years.* The 2004 Delta region mortality rate of 987 deaths per 100,000 population was at the level the overall nation achieved 21 years earlier in 1983 (986 deaths per 100,000 population).
- *Mortality rates in the Delta have fallen more slowly over time than in the nation as a whole (Figure 4).* Between 1983 and 2004, the average annual reduction in mortality for the U.S. was approximately 0.9%, whereas the average annual reduction in the Delta region was 0.4%.
- *As a result, the magnitude of the disparities between the Delta and the nation has increased.* The disparities from 1968 to 1982 averaged 90 excess deaths per 100,000 population. By 2004, the disparity had more than doubled, and the number of excess deaths had increased to roughly 18,000 individuals per year (Figure 5) – *equivalent to the loss of a moderate size Delta region community each year.*

In addition to poor overall health statistics, considerable racial disparities in health measures persist in the Delta. The health differences between white and African American populations in the Delta are illustrated by the differences in infant mortality and the incidence of low birth weight babies. The rates for African Americans was approximately twice that for whites for both measures between 2001 and 2003 (15.0 vs. 7.2 infant deaths/1000 live births

[49] Authors' analysis of data from the Area Resource File, 2006 edition.

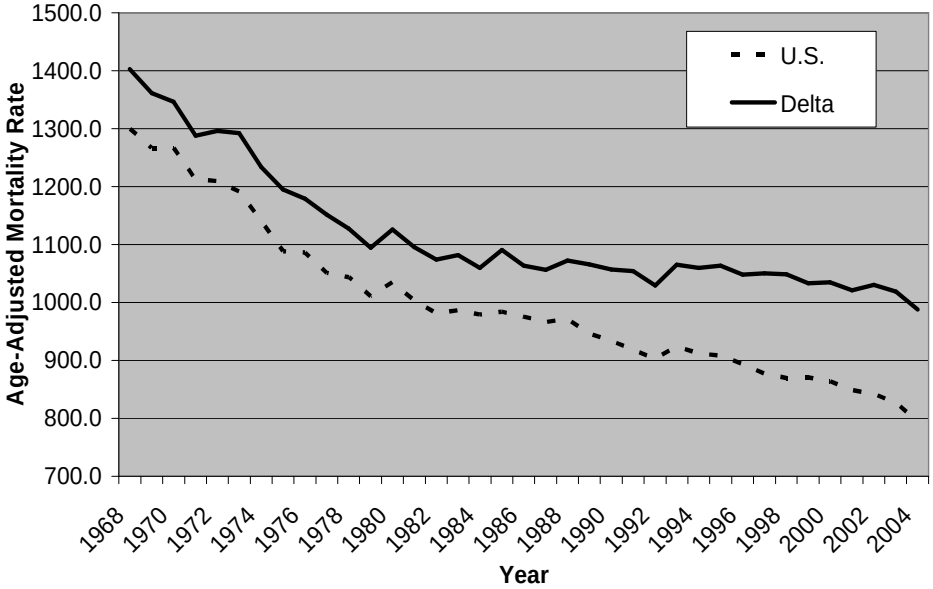

Figure 4: Age-adjusted all-cause mortality in the Mississippi River Delta from 1968 through 2004. Cosby AG, Bowser DM. The health of the Delta region: a story of increasing disparities. J Health Hum Serv Admin 31:58, 2008.

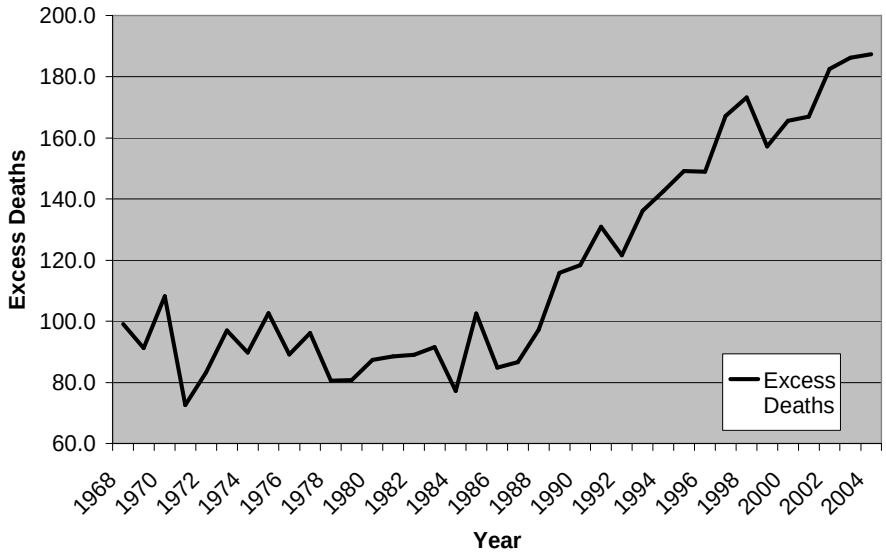

Figure 5: Excess deaths in the Mississippi River Delta, estimated from the difference in death rates in the Delta and the U.S. From Cosby AG, Bowser DM. The health of the Delta region: a story of increasing disparities. J Health Hum Serv Admin 31:58, 2008.

and 144.6 vs. 78.9 low birth weight babies per 1000 live births, respectively).[50]

Data collated by Arthur Cosby and his associates at Mississippi State University show that for cardiovascular disease mortality the racial disparity is

[50] Authors' analysis of the Area Resource File, 2006 Edition.

both large and increasing.[51] In 2004, the age-adjusted mortality rate for African Americans in the Delta counties of Mississippi was 20% higher than for white Delta residents (681 vs. 570 deaths per 100,000 population). The time-trends of mortality rates show that the racial differences in cardiovascular mortality increased from the 1980s through 2001. Before 1987, cardiovascular disease mortality for African American males was actually lower than for white males; after 1987, the differences reversed to peak in 2001.

The combination of poor overall health outcomes in the Delta and the superimposed racial disparities has additional significance. It indicates that health among African Americans in the Delta cannot only be compared to health among the region's white population; they must be compared to national averages or other benchmarks to assess severity. Comparing those statistics to only Delta whites would be comparing them against an unacceptable low level.

C. ECONOMIC CONDITIONS IN THE DELTA

The Delta, in addition to being one of the least healthy regions of the nation, is also one of the poorest. The economic history and current conditions in the Delta have been summarized by Dr. John Gnuschke and his colleagues at the University of Memphis.[52] Major conclusions included the following.

- *Of the ten states with the highest poverty rates and lowest income levels in 2004, six were Delta states.* These six states include all of the lower Mississippi River Delta states (Table III). Mississippi and Louisiana had the highest poverty rates in the nation (19.3% and 19.2%, respectively). Mississippi had the second lowest median household income; Louisiana and Arkansas were ranked third and fourth. Mississippi residents had $9750 less income than the average American in 2005.[53]
- *The incidence of poverty was particularly severe for children aged 0-17 years*. Over one-fourth of children in Mississippi and Louisiana were living in poverty in 2004 (Table III).
- *In 2000, 55% of Delta counties had poverty rates that were among the top 20% of all U.S. counties, and 12 of the 25 lowest income counties in the nation were Delta counties.* The median household income in these counties was less than $22,000 (Figure 6), and the overall poverty rates for most of the lowest income counties were over 30.0%. Youth poverty rates were frequently more than 40.0%.

[51] Cosby A, Mirvis DM, James W, Neaves T, *et al*. *An Assessment of Cardiovascular Disease Mortality in the Mississippi Delt*a. Starkville, MS: Mississippi State University, 2008.
[52] Gnuschke JE, *et al*., *op. cit.*
[53] Southern Education Foundation. *Miles to Go - Mississippi.* Atlanta, GA: Southern Education Foundation, 2008.

Table III: Income and Poverty Rates in States of the Lower Mississippi River Delta

State	Rank	Median Household Income	Poverty Rate	
			All Ages	Ages 0-17 Yrs
Mississippi	1	$34,278	19.4%	28.6%
Louisiana	2	$35,216	19.2%	27.4%
Kentucky	5	$37,046	16.3%	22.2%
Alabama	8	$37,062	16.1%	22.7%
Arkansas	9	$35,295	15.6%	22.7%
Tennessee	10	$38,945	15.0%	20.1%

From Gnuschke JE, Hyland S, Wallace J, Hanson R, Smith S. Still a long way to go for the Lower Mississippi Delta. J Health Hum Serv Admin 31:72, 2008.

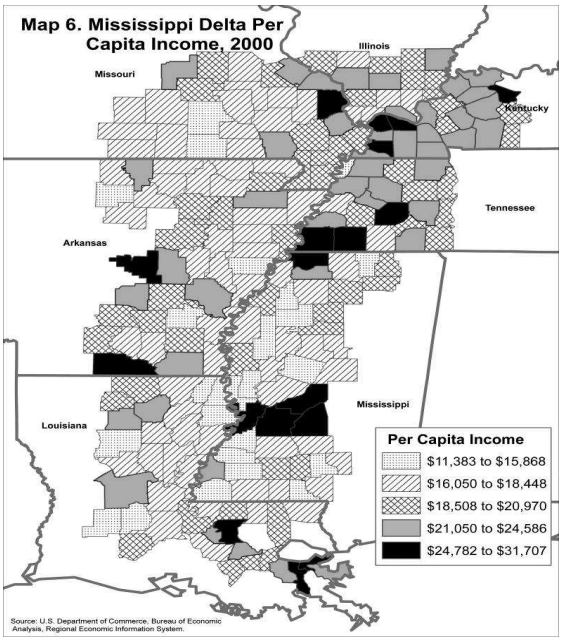

Figure 6: Mississippi River Delta Per Capita Income in 2000. From Gnuschke JE, Hyland S, Wallace J, Hanson R, Smith S. Still a long way to go for the Lower Mississippi Delta. J Health Hum Serv Admin 31:72, 2008.

- *Unemployment remains high in the Delta (Figure 7),* with pockets of unemployment reaching or exceeding 10%. Unemployment rates in 2000 exceeded 9.0% in the core Delta counties in Mississippi and Louisiana.

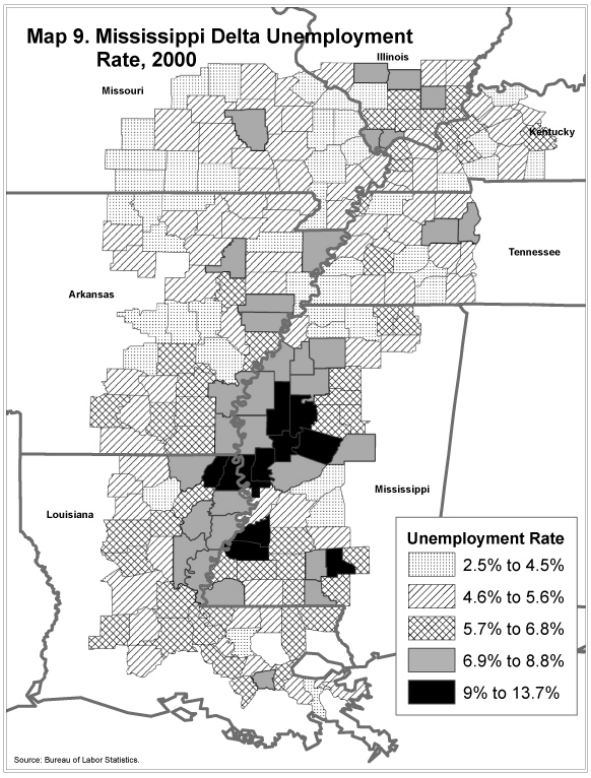

Figure 7: County-level unemployment rates in the Mississippi River Delta in 2000. From Gnuschke JE, Hyland S, Wallace J, Hanson R, Smith S. Still a long way to go for the Lower Mississippi Delta. J Health Hum Serv Admin 31:72. 2008.

- *Employment patterns over the past decades have changed,* with declines in agriculture, retail trades, and manufacturing, and with increases in service trades and in government. In a sample of Delta counties, agriculture accounted for 7.0% of total employment in 1990 but just 6.0% in 2005. Similarly, manufacturing accounted for 19.3% of all jobs in 1990 but fell to 13.4% by 2005.
- *The lack of employment and income opportunities in the Delta promoted multiple generations of out-migrants and a regional brain drain.* Those people left behind were frequently the least prepared to meet the challenges of the modern workplace.

There has been improvement in economic conditions during the two decades between 1980 and 2000, although conditions remain dire. As noted by Gnuschke, *et al.,*[54] "with this long-standing record of low-income levels, high poverty rates, and persistent income inequality, the Delta counties have had nowhere to go but up." These economic conditions are related to educational levels, as will be considered next, as well as to health as discussed above.

[54] Gnuschke, *et al*., *op. cit.*

D. EDUCATION IN THE DELTA

The Delta states have some of the lowest levels of educational achievement in the nation. Data collated by the Southern Education Foundation[55] indicate that the lack of an educated and trained workforce has always been a major barrier to economic development efforts that focused on attracting high-wage employers to the Delta. These data show that:

- in 2000, 9.9% of Delta residents over the age of 25 years had fewer than 9 years of education, compared to a national level of 7.7%;
- in 2000, 27% of Mississippi adults did not have a high school diploma;
- in 2004, Mississippi ranked 48th among the states in college education with only 20% of residents having a college degree;
- the rate of college graduation, as a percent of the national rate, has fallen progressively since 1980;
- fourth and eighth grade Mississippi students, in 2005, lagged more than one grade level behind the national average in mathematics; and
- between 1990 and 2000, Mississippi lost 5000 adults with a college education and gained 10,000 adults without a high school degree.

These statistics place the Delta states more in-line with the worst performing OECD nations than with the rest of the United States.

Table IV: Measures of Educational Attainment in the U.S., the Eight Delta States, and the 240 Delta Counties.

Percent of residents with	**Total US**	**Delta States**	**Delta Counties**
less than 9 years of education	7.55%	8.60%	9.94%
high school diploma	80.40%	77.67%	73.71%
4 or more years of college	24.40%	21.01%	17.17%
less than 9 years of education, white	5.90%	7.70%	8.54%
less than 9 years of education, African American	7.93%	9.99%	13.04%
high school diploma, white	83.58%	80.24%	77.94%
high school diploma, African American	72.26%	68.14%	63.35%
4 or more years of college, white	26.06%	22.47%	19.41%
4 or more years of college, African American	14.26%	12.21%	10.81%

Source: Author's analysis of Area Resource File, 2006 edition.

[55] Southern Education Foundation, *op. cit.*

Data on Delta counties are even starker. In Mississippi, for example, the state's Delta counties have the lowest rates of high school graduation in the state.[56] Data on selected measures of educational achievement in the 240 Delta counties, the eight Delta states, and the nation are shown in Table IV. The Delta states have lower levels of educational attainment than the nation, and the Delta counties have lower levels than the Delta states as a whole. This pattern mimics the health statistics shown below; the portions of states in the Delta have more severe problems than do the states overall.

III. CHALLENGES TO HEALTH IMPROVEMENT IN THE DELTA

Efforts to improve health and related conditions in the Delta have been longstanding[57] but conditions remain substantially below the national level. In this section, we will examine a few of the significant barriers to improvement that will, in turn, influence the success of proposed interventions. The information in this section is based on the key informant interviews supplemented by research group discussions and the published literature.

A. THE COMPLEXITY OF THE PROBLEM

In many ways, addressing the problem of poor health is made more complex by the nature of the problem itself. While efforts addressing many societal problems have many common barriers, some may be more specific and important to efforts to improve health. These include the following.

- *The number and intensity of factors determining health (Figure 2) suggest that "everything counts, all the time."*[58] Hence, the problem may seem insurmountable and unapproachable.
- *The determinants of health are multiple and interactive.* As described above, the relationships among health, education, and economics are multidimensional and multidirectional, with each factor affecting the others. Thus, a substantial change in one determinant may not cause a measureable change in a health outcome because of the effects of other, unchanged variables. For example, low utilization of prenatal care may be due to both lack of insurance coverage and limited numbers of providers; an effort to expand insurance coverage may ameliorate one factor, but overall utilization may not increase because the other factor remains limiting.
- *Poor health itself inhibits health improvement.* The sick are less able to access and to participate in health improvement activities that require transportation, cost, etc. Thus, poor health status, such as in the Delta, tends to be self-perpetuating, and health improvement

[56] Southern Education Foundation, *op. cit.*
[57] See, for example, Gnuschke J, *et al*., *op. cit.,* and Hyland S. Reflections on the culture of the lower Mississippi Delta: challenges and opportunities. J Health Human Serv Admin 31:156, 2008.
[58] Low, *et al*., *op. cit.*

requires very specific interventions targeting the ill. A similar relation exits for efforts to reduce poverty; the poor may not have the personal or fiscal resources to utilize programs aimed at improving their conditions.

B. FOCUS ON INCREMENTAL, SHORT-TERM CHANGE

Efforts to produce change in health and other sectors in the Delta have largely been incremental. That is, interventions have been very focused and limited, and have generally not considered the underlying factors (Figure 2) that have caused the poor health and economic conditions.

Economic interventions seem not to have adjusted to the major changes in agriculture industrialization, etc.[59] What may be needed is transformative rather than incremental change in major sectors. For example, development of biofuel and other biobased product industries in the Delta may provide new opportunities grounded on the already existing agricultural base of the region.[60]

In addition, many interventions have been initiated by grants from various governmental or philanthropic agencies or promoted by academic institutions. These projects, while well-meaning and effective, commonly focus on the interests of the grantor rather than the real, integrated needs of the community.[61] In addition, they commonly lack sustainability, ending when project funding ends. They may also lack scalability, working in the small pilot areas but not applicable to the broader community or region. Other projects, especially those sponsored by governments, focus on short time frames often corresponding to political cycles, whereas effective change will be a long-term goal.

C. COORDINATION OF EFFORTS

An important issue raised in each key informant interview was the lack of coordination of the efforts of the many public and private organizations to improve conditions in the Delta. This fragmentation inhibits the synergy among organizations and disciplines necessary for a comprehensive understanding of the issues facing the Delta and for the development of effective interventions to produce long-lasting and meaningful improvements.

Examples of this fragmentation cited in the interviews include the following.

- *The various organizations have differing operational and geographic definitions of the scope of "the Delta" in which they work.* These range from 240 counties in eight states to the three states of Arkansas, Louisiana, and Mississippi, and to only 18 counties in northwest Mississippi. This results in limited abilities to work together for

[59] Gnuschke, *et al*., *op. cit.*
[60] Ramezanpor C, Nelson P. *Biofuels, Biobased Products, and Green Technology: Opportunities for the Mississippi River Delta*. Biodimensions.net/pdf/MSDeltaBioproducts.pdf.
[61] Smith BH. Health and economics in the Mississippi Delta: problems and opportunities. J Health Human Serv Admin 31:168, 2008.

common objectives, different quantitative and qualitative assessments of the issues facing the region, and geographic fragmentation of analyses and interventions based on artificial or political boundaries that do not consider the commonality of issues in and the interdependence of adjacent areas.

- *The activities of the multiple organizations are not coordinated,* and there may be competition for resources or credit among the groups, leading to duplication of efforts, gaps in scope of efforts, and limited resources (both financial and expertise) to achieve success.
- *Health-related activities of various groups in the same or in adjacent states may focus on different health problems*, e.g., expanding primary care vs. preventing tertiary complications of common illnesses, reducing opportunities for synergy.
- *Activities of the multiple academic institutions in and around the Delta have been uncoordinated*, with each program undertaking projects based on its own specific interests and expertise rather than on the coordinated, integrated needs of the region. This results in limited resources and interdisciplinary thinking, based on the capabilities and limitations of each institution.

D. THE DELTA AS A MULTISTATE REGION

The Mississippi River Delta contains, on one hand, counties of many states and, on the other hand, only a portion of all the counties of these states. Of the eight states included by the federal government in the Delta, only one-third of counties and 22% of the state populations are included in the Delta.[62]

Previous studies[63] have shown that the counties in the eight Delta states that are in the Delta differ in critical aspects of demography, health, education, and economy from the remainder of the states' counties (Table V). For example, while the Delta counties have only 22% of the states' population, they have 38% of the states' African American population, 29% of births to teenage mothers, 28% of infant deaths, and 28% of families living in poverty. Similar issues in education were described above.

This multi-state, partial-state nature of the Delta, compounded by the intrastate regional differences in health needs, presents numerous challenges to health improvement.

First, geographic patterns of morbidity, mortality, and the determinants of health (e.g., environmental health issues) commonly cross state borders to include contiguous portions of adjacent states. For example, epidemiologic

[62] Mirvis DM. The Mississippi Delta: is it a region? Presented at the 2005 Public Health Systems Research Meeting, Boston, MA, June 2005.
[63] Mirvis DM, *ibid.*

Table V: Proportion of Demographic, Health, and Economic Characteristics in Delta States That Are In Delta Counties

Characteristic (year)	NonDelta Counties	Delta Counties	Delta States Total	% in Delta Counties
Total Population (2006)	34,273,666	9,254,104	43,527,770	21.26%
Total African American Male Population (2004)	2,349,455	1,452,193	3,801,648	38.20%
Total African American Female Population (2004)	2,652,652	1,625,453	4,278,105	37.99%
Pop 65+ Yrs Old (2004)	4,203,847	1,199,430	5,403,277	22.20%
Foreign Born Population (2000)	2,041,589	195,195	2,236,784	8.73%
Urban Population (2000)	23,468,120	5,697,213	29,165,333	19.53%
No. of Single Parent Households (2000)	1,327,688	494,215	1,821,903	27.13%
Total Births (2001-3)	1,387,611	398,817	1,786,428	22.32%
Low Birth Weight Births (2001-3)	118,014	42,048	160,062	26.27%
Very Low Birthweight Births (2001-3)	22,401	8,544	30,945	27.61%
Births to Teens (2001-3)	55,257	22,440	77,697	28.88%
Births to Unmarried Mothers (2001-3)	478,851	185,967	664,818	27.97%
Births With Late/No Prenatal Care (2001-3)	40,578	16,803	57,381	29.28%
Infant Deaths (2001-3)	10,866	4,133	14,999	27.56%
Persons in Poverty (2004)	4,551,524	1,755,700	6,307,224	27.84%
Persons 25+ Years Old With <9 Yrs Ed (2000)	1,742,940	591,129	2,334,069	25.33%
16+ Year Olds Unemployed (2000)	925,639	304,567	1,230,206	24.76%

Source: authors' analysis of Area Resource File, 2006 edition.

patterns of overall mortality,[64,65] prostate cancer mortality,[66] and influenza-related mortality[67] all show geographic clusters that span state borders.

[64] Cossman RE, Cossman JS, Jackson R, Cosby A. Mapping high and low mortality places across time in the United States: a research note on a health visualization and analysis project. Health & Place 9:361, 2003.

[65] Murray CJL, Kulkarni SC, Michaud C, Tomijima N, Bulzacchelli MT, Iandiorio TJ, Ezzati M. Eight Americas: Investigating mortality disparities across races, counties, and race-counties in the United States. PLoS Medicine 3:e260, 2006.

However, most public policies, including policies related to health care financing, regulation, and planning, are defined at the state-level. For example, federal Medicaid funding is allocated based on state-wide income criteria and Medicaid policy generally (without a waiver) requires that benefits and other criteria be implemented at a state-wide level. Although some federal programs (such as Ryan-White Part A and portions of funding for bioterrorism and pandemic influenza prevention) are based on interstate boundaries, many are based on metropolitan statistical areas rather than larger regions, and many others remain purely state-delimited.

People living in geographically adjacent areas with similar health issues may, then, have different access to needed health care services because they are parts of different states with different policies and services rather than because they have different health care needs. Thus, there is a fundamental disconnect between health, health care patterns, and political boundaries.

This issue is related to and exacerbated by numerous factors and examples discussed in the key informant interviews.

- Interventions that require legislative action require such action in each participating state, increasing the complexity of implementing a change (although, as noted in the interviews, a regional emphasis may increase the likelihood of passage in multiple states).
- The different organizational structures of health departments exist in the states (e.g., centralized structures with a single state-wide agency in some states, and mixed centralized-regional structures with a central agency responsible for health issues in rural regions but other local agencies responsible in large metropolitan areas in others) increases the number and purviews of stakeholders[68] and reduces the likelihood of coordination of resource allocation and planning.
- The different appointment processes and tenures for state health officers (e.g., career vs. political appointees) limit coordination of priorities and long-term perspectives.
- State policy leaders have a general unwillingness to support initiatives that spread resources to neighboring states, even if to the benefit of their own state.
- Leaders exhibit a distrust of and competition with policy leaders in adjacent states, based on political parties, federal resource allocation,

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[66] Rusiecki JA, Kulldorff M, Nuckols JR, Song C, Ward MH. Geographically based investigation of prostate cancer mortality in four U.S. northern plain states. Am J Prev Med 30(Suppl. 2):S101, 2006.

[67] Greene SK, Ionedes EL, Wilson ML. Patterns of influenza associated mortality among US elderly by geographic region and virus subtype, 1968-1998. Am J Epidemiol 163:316, 2006.

[68] For example, the Memphis-Shelby County Health Department does not directly report to the Tennessee Department of Health whereas other county health departments in Delta regions of the state do. Hence, for the Delta portions three state region of Arkansas, Mississippi, and Tennessee, there are four rather than three major health departments.

and cross-state resource issues (e.g., support of health care for patients from neighboring states).

- Adjacent states may be in different organizational regions of federal agencies such as the Centers for Disease Control and Prevention, increasing barriers to coordination.
- Different groups may advocate for the same issue in different states, leading to fragmentation of effort and to competition between groups.
- Adjacent states may apply for grants that compete with each other, reducing the chance that any will be funded.
- Differences in state requirements for health care provider licensure, especially for non-physicians, limits cooperation in services such as telehealth that cross state borders.
- Data sharing across states may be inhibited by differing privacy regulations (although memoranda of understanding do exist between states for some aspects of data sharing), and differences in data elements, database structures, and communication technology.
- Health information accessed by residents in one state may originate in an adjacent state. For example, residents of eastern Arkansas listen to radio stations in Mississippi and Tennessee, and the health improvement priorities reflected in these messages and resources of those states may differ from those of Mississippi.

Second, the needs of portions of states with particularly severe health needs, such as the counties that are in the Delta, may be under-represented within single state health plans aimed at the entire state. This may especially be so, as in the Delta, when the most severely afflicted portions of the state are also the poorest, the least educated, and have the least political leverage.[69] This has been demonstrated in, for example, public health funding.[70] This leads to problems of resource allocation within a state, that is, whether state resources should be allocated based on numbers of residents, severity of need, political considerations, etc.[71]

Third, when people move across state borders for medical care that is not otherwise available in their home state, the usual coordination and payment systems for care may be disrupted. For example the tertiary care referral region to Memphis (Tennessee) includes large portions of Arkansas, Mississippi, Kentucky, and Missouri.[72] This cross-state migration for care is particularly problematic for poorer persons who are dependent upon governmental health

[69] Galbraith JK. *The Culture of Contentment.* Boston: Houghton Mifflin, 1992.
[70] Mays GP, Halverson PK, Baker EL, Stevens R, Vann JJ. Availability and perceived effectiveness of public health activities in the nation's most populous communities. Am J Pub Health 94:1019, 2004.
[71] See discussion of resource allocation in Stone D, *The Policy Paradox. The Art of Political Decision Making*, 2nd ed. New York: W.W. Norton, 2001.
[72] The Dartmouth Atlas of Health Care, http://www.dartmouthatlas.org/

care funding such as Medicaid or through state or local health departments. The out-of-state facilities providing care are commonly not or only partially reimbursed, and they may restrict access to needed services. One example is the county-funded referral hospital in Memphis (the Regional Medical Center or "the MED") that cares for large numbers of patients from neighboring areas of Mississippi and Arkansas but receives low levels of reimbursement from these states for care delivered to their citizens; in 2003, 27.6% of the MED's uncompensated care burden was from patients from Arkansas or Mississippi.

These three public policy areas impact general public health issues, such as obesity, infant mortality, and mortality form common diseases, as well as uncommon, catastrophic events such as infectious disease epidemics and bioterrorism. A recent RAND study identified this issue as an important one inhibiting adequate regional preparation for terrorism preparedness.[73]

E. INTRA-REGIONAL DIFFERENCES

Although the Delta is commonly discussed as a single, homogeneous region, its member counties have marked differences in demographics, health, economics, and education.[74] Data in Table VI illustrate the range of key factors within the Delta. For example, the Delta counties of Illinois and Kentucky have a much lower proportion of African Americans than do the Delta counties of Mississippi and Tennessee. These differences represent the geographic spread of the region and the mix of rural and urban areas. Thus, within the Delta, different subregions will have different needs, and different approaches based on population characteristics may be required.

Table VI: Maximum and Minimum Values for Selected Measures Among the Eight Delta States

	Max	Min
Number of Delta Counties in State	46	16
Average Delta County Population	72,465	21,542
Percent of Population - Black	52.04%	4.47%
Percent of Births - Low Birth Weight	11.84%	8.34%
Percent of Births - Very Low Birth Weights	2.44%	1.40%
Percent of Births - Late/No Prenatal Care	6.47%	1.65%
Infant Deaths Per 1000 Births	13.09	6.57
Percent of Population in Poverty	22.13%	14.63%

From the author's analysis of Area Resource File, 2006 edition

F. REGIONAL CULTURE AND HISTORY

The culture in the Lower Mississippi River Delta has several aspects that

[73] Wasserman J, Jacobson P, Lurie N, *et al*. *Organizing State and Local Health Departments for Public Health Preparedness*. Santa Monica, CA: The RAND Corporation, 2006.
[74] Mirvis DM, *op. cit.*

hamper improvement.[75] First, the region's long history of structural dependency under the southern progressive philosophy has shaped the culture of the Delta and the character of its people. Former Congressman Ed Jones called it the "plantation mentality, an ingrained attitude – a kind of caste system – rooted in the region's history. The landowning rich remain complacently superior. The poor, too often, remain apathetic, without any realistic job prospects and utterly dependent on welfare".[76]

Related to this legacy of dependency are regional beliefs of fatalism, personalism, and factionalism. Fatalism reinforces the dependency through religious beliefs that include the role of suffering in attaining redemption and salvation. The trust that residents put in government or a benign "boss" to take care of them often leads to a lack of risk-taking and a lack of personal and institutional accountability. This is manifest in the belief that "what difference does it make since it will all turn out the same". A related cultural concept is that of "redemption", that is, only religion can help. Hence, the church has an important role in implementing change. Factionalism in the rural Delta accentuates the separateness and isolation of residents with an intolerance and mistrust of others, including non-kin, other ethnic groups, and all outsiders. All of these ingrained cultural issues inhibit change.

Also related to these cultural aspects is the critical issue of racism, leading to discrimination against individuals and against regions, like the Delta, with high proportions of minorities. Although blatant acts of racism have decreased in the nation in general, underlying biases that influence decision making and behaviors remain common. In one recent national survey, 13% of whites self-identified as being racially biased, and 84% of Blacks and 66% of whites indicated that racism remains a serious problem.[77] The Institute of Medicine has identified racial and ethnic discrimination as a major cause of racial and ethnic health disparities.[78]

In many cases, the racial bias may coexist with overt egalitarian attitudes, and it may not result in overt acts of racism. Rather, it may result in more subtle forms of discrimination in which the bias is not as apparent and in which there is more legitimate discretion in decision making.[79] Public policy making and health care are two fields in which these conditions exist.

A final aspect of culture is the stigma of certain diseases among various racial and ethnic groups that reduce the likelihood of early identification and intervention. For example, among many groups, the stigma of mental health

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[75] Hyland S. Reflections on the culture of the lower Mississippi Delta: challenges and opportunities. J Health Human Serv Admin 31:156, 2008.
[76] Hyland, *ibid.*
[77] Shabazz S. Racism in the 21st century: the problem of the color line. FinalCall News.com News , February 2007.
[78] Institute of Medicine. *Unequal Treatment. Confronting Racial and Ethnic Disparities in Healthcare.* Washington, DC: National Academies Press, 2003.
[79] Dovidio JE, Penner LA, Albrecht TL, Norton WE, Gaertner SL, Shelton JN. Disparities and distrust: the implications of psychological processes for understanding racial disparities in health and health care. Soc Sci Med 67:1, 2008.

problems inhibits diagnosis and treatment. Similarly, the stigma of HIV infection among African American males leads to treatment delays until AIDS emerges and inhibits effective public health control measures.

G. DATA LIMITATIONS

A significant challenge to conducting research on issues facing the Delta is the limited availability of health-related data on a regional level. Some datasets are based on national samples and do not reflect state-specific conditions. Most health-related datasets are available only at the level of the state and not at the county (or smaller) level, making analysis of conditions in regions such as the Delta that cross state boundaries and that include only non-representative portions of states difficult.

Substate, that is, county level, data is needed to:

- develop aggregate data for geographic units that cross state boundaries, such as the Delta;
- assess differences in demographic, socioeconomic, health, and other variables in parts of states that may differ substantially from each other, as shown in Table IV;
- assess health needs of counties and other geographic units within states that form the basis for planning health delivery systems;
- demonstrate the importance of specific policy issues to policy makers from districts heavily affected by policy options; and
- apply modern data analysis methods, such as geographic mapping (GIS) that rely upon accurate data at small geographical regions to explore spatial interrelations among health, socioeconomic, environmental, and demographic forces.

The availability of substate data is, however, limited. Most surveys of health insurance are designed to produce national estimates of health insurance coverage. A recent review of the utility of these national surveys to produce state-level estimates of the uninsured[80] described substantial limitations in each survey, including sample sizes too small to provide state estimates without combining multiple years of data; sampling of only certain subpopulations, e.g., working age adults; the inability to provide estimates on important subpopulations, e.g., children, minorities and geographic regions; lack of adequate depth and breadth of health questions, including issues of state-specific interest; lack of public accessibility; and lack of timely release of data. These issues are reflected in the wide variation in estimates of the uninsured the various surveys produce; for example, estimates of the percent uninsured in Wisconsin in 1998 varied from 7% to 13% among five national surveys.

[80] Blewett LA, Good MB, Call KT, Davern M. Monitoring the uninsured: a state policy perspective. J Health Polit Pol Law 29:107, 2004.

Several examples illustrate these limitations.[81]

- Some data sets are designed at a national level, including the Current Population Study, the National Health Inventory Survey, the Community Tracking Study, and parts of the Medical Expenditure Panel Study (MEPS), that sample only selected communities across the nation.
- Some data are available at a state but not at a county level, including the data included in the Current Population Survey that can be used at the state level after combining data for multiple years but includes persons from only a small proportion of counties in each state.
- Other data are available at a state level, but with different data elements in each state. For example, the Behavioral Risk Factor Surveillance System (BRFSS) includes a national core but each state may add data fields based on their own needs.
- Some states, such as Arkansas for the MEPS, have increased the sample size, at their own expense, to provide state estimates for some surveys, whereas most other states have not.
- Other data are available for all states but for different years, with data gaps that differ from state to state.
- Different states and agencies use different definitions of key variables, such as race and ethnicity.
- Some databases, such as the health care data in the MEPS, BRFSS, and economic and labor data from the Bureau of Economic Research and Bureau of Labor Statistics, are available for selected metropolitan statistical areas which may include some but not all counties of a region.
- Other datasets maintained by individual states, e.g., the Tennessee Joint Annual Report of Hospitals, that may include county level aggregate data but differ in content and file structure across states.

Recently, statistical methods to estimate substate statistics, without increasing sample sizes, have been developed.[82,83] Health care expenditures and insurance data for 10 large metropolitan areas using the Medical

[81] An extensive, annotated list of data sets with county-level data has been compiled and is available from the authors.
[82] Fisher R, Turner J. *Small Area Estimation of Health Insurance Coverage From the Current Population Survey's Annual Social and Economic Supplement and the Survey of Income and Program Participation.* http://www.census.gov/hhes/www/sahie/pubs/fisherturnerasa04.pdf, 2005.
[83] State Health Access Data Assistance Center: *Overview of Approaches for Estimating Uninsurance Rates at the Substate Level.* Minneapolis, MN: University of Minnesota State Health Access Data Assistance Center http://www.shadac.umn.edu/.

Expenditure Panel Survey have been published.[84] The Census Bureau has recently published county-level statistics on insurance based on the 2000 census.[85]

H. OTHER BARRIERS

Other generic barriers to health improvement efforts also are to be considered.[86] These include:

- the declining population size of the Delta (as noted above) due to out-migration, leading to reductions in apportioned resources and public policy attention;
- the limited financial and human resources, especially during periods of overall budget reductions;
- a general lack of trust in government;
- turf issues and confusion within and among official agencies, communities, not-for-profit organizations, academic institutions, business groups, and health care providers;
- organized opposition to change by stakeholders with particular interests;
- limited legal capacity to act;
- the complexity of preventive interventions, requiring social, life-style, and personal behavior changes in addition to policy decisions and changes in capital investment;
- the broad nature of health improvement efforts, requiring interventions by groups beyond the usual health policy world; and
- interest group dynamics, with more organized groups supporting expanding medical care than supporting changes in other determinants of health and other groups (e.g., tobacco and soft drink companies) at risk of financial loss with widespread prevention efforts.

IV. RESEARCH AND INTERVENTION STRATEGIES AND OPPORTUNITIES IN THE DELTA

The need for additional research on health-related issues in the Delta has been underscored by Dr. Garth Graham, Deputy Assistant Secretary for Minority

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[84] Machlin SR, Mixon AJ, Sommers JP. *Health Care Expenditures and Percentage Uninsured in 10 Large Metropolitan Areas, 2000.* MEPS Statistical Brief #38. Washington, DC: Agency for Health Care Research and Quality, 2004.

[85] See www.census.gov/statab/ccdb/ccdbstcounty.html.

[86] McGinnis JM, Williams-Russo P, Knichman JR. The case for more active policy attention to health promotion. Health Aff 21(2):78, 2002.

Health of the U.S., Department of Health and Human Services.[87] He identified two general needs:

- *the need to greatly improve research and evaluation capabilities in the Delta, including the ability to do multidisciplinary research at the systems level and on program services, as well as evaluation;* and
- *the need to experiment, to try out a variety of cooperative public and private sector approaches that attempt to reinforce the positive linkages between health and economic performance.*

The information presented earlier in this report suggests important areas for further study and action to meet these needs. These may be grouped into several overlapping areas of interest.

A. GENERAL STRATEGIES FOR A RESEARCH AND INTERVENTION AGENDA IN THE DELTA

The success of research and intervention projects focusing on the Delta may be enhanced by focusing on several fundamental strategies.

- *Projects and interventions should be evidence-based and developed on specific and testable hypotheses,* that is, using the tools of scholarship.
- *Projects should reflect the needs of the community and the multiple goals and objectives of the regional health care systems.*
- *Projects should emphasize the interrelationships among the proximate, intermediate, and primary health determinants (Figure 2) as well as the interrelationships between health, economics, education, and other sectors.*
- *Projects should consider the downstream consequences of interventions as well as the more immediate results.* This includes the impacts of health interventions on economic conditions and on education, and the impacts of economic and other interventions on health.
- *Projects should incorporate the specific demographic, historical, and cultural features of the Delta that differ from other parts of the nation and that will influence the design, implementation, and outcomes of interventions.*
- *Projects should emphasize the role of the community, that is, they should emphasize community-based participatory research.* [88] This involves working *with* communities, rather than just *in* communities, to

[87] Graham G. Health and economic development in the Mississippi Delta region. J Health Human Serv Admin 31:174, 2008.
[88] Agency for Healthcare Research and Quality. *Community-Based Participatory Research: Assessing the Evidence.* Washington, DC: Agency for Healthcare Research and Quality, 2004.

identify the issues of greatest importance, design the research, recruit subjects, develop interventions, and interpret and disseminate research findings. As emphasized by Dr. Barry Smith, Executive Director of the Dreyfus Health Fund, [89]

> "absolutely critical…is the incorporation of the people themselves into the intervention, not as passive recipients of the program but as critical actors who will ultimately make the program a success or a failure, and if successful, make it sustainable by virtue of having taken it on as their own and woven it into the fabric of their community…. All too often in the past, the 'people' have been regarded as the problem and passive recipients of what outsiders 'know' to be right."

- *Projects should include mechanisms for wide-spread dissemination of results to the range of interested stakeholders, including decision makers and community leaders, as well as the scientific community.* To be effective, research programs on health in the Delta must include specific processes for the effective linkage between research and policy making. [90] The goal of this "knowledge brokering" is to link "decision makers and researchers, facilitating their interaction so they are able to better understand each other's work, forge new partnerships, and promote the use of research-based evidence in decision making."[91] This includes collaboration between investigators and policy makers in identifying and conducting research that is relevant to important policy issues, as well as the translation of research results into forms that are timely, relevant, available, and understandable by policy makers.
- *Projects should span multiple disciplines and sectors, and involve a range of organizations including academic,[92] governmental and private groups*. As described above, the health of a community is directly related to a range of factors that are studied by a wide variety of academic disciplines and that are under the decision-making purview of multiple organizations and agencies.[93]
- *Projects should focus on population segments where the impact, whether the health, economic, or other outcomes, and the political interest is greatest, e.g., the poor and children.* [94]

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[89] Smith BH*, op. cit.*
[90] Black N. Evidence based policy: proceed with care. Brit Med J 323:275, 2001.
[91] Canadian Health Services Research Foundation, www.chsrf.ca/brokering/index_e.php.
[92] For information on the role of academic institutions in community development, see the Report of the Commission on Community-Engaged Scholarship in the Health Professions, depts.washington.edu/ccph/kellogg3.html.
[93] For information on the special role of academic institutions in public policy analysis, see Hyland, *op. cit.,* and Praznik D. Foreword. Med Care 37:J81, 1999.
[94] Syme SL, Lefkowitz B, Krimgold BK. Incorporating socioeconomic factors into U.S. health policy: addressing the barriers. Health Aff 221(2):113, 2002.

- *Projects should identify strategies to assure sustainability after the initial, externally funded phase and to assess scalability of pilot projects.*
- *Projects should include economic analyses, including cost benefit analyses and macroeconomic assessments related to communal economic development and functions.*
- *Projects should be based, when appropriate, on established health system and economic models,* such as the Behavioral Health Model for access to care,[95] production function models,[96] or other models of development for econometric analyses.
- *Projects and interventions should include an assessment process based on predetermined success factors and benchmarks.*

These strategies are depicted in Figure 8.[97] The front includes the categories of social determinants. The right side of the cube includes key

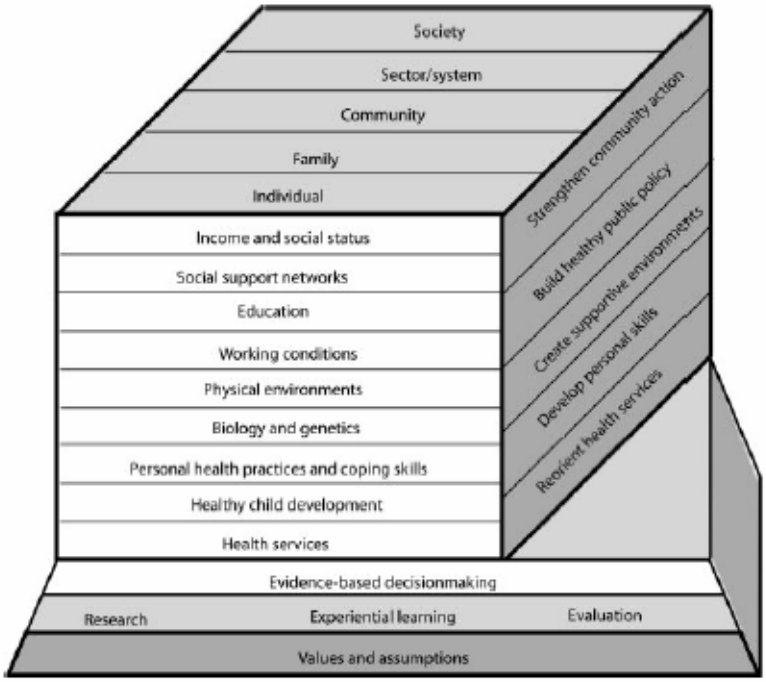

Figure 8: The Population Health Promotion Model providing a model for research projects in the Mississippi River Delta. From Evans RG, Stoddart GL. Consuming research, producing policy? Am J Prev Med 93:371, 2003.

[95] Davidson, *et al*., *op. cit.*
[96] Bloom, D E, Canning D, Sevilla P. The effect of health on economic growth: a production function approach. World Development 32:1, 2003.
[97] Evans RG, Stoddart GL. Consuming research, producing policy? Am J Pub Health 93:371, 2003.

strategies for interventions, and the top shows the community levels at which the interventions may act, while the base illustrates aspects of the evidence foundation on which the other aspects stand.

B. DATA IDENTIFICATION AND COLLATION

A critical first step in promoting research in the Delta is the development of accurate, complete, and accessible databases. These data are needed to develop a targeted, outcome oriented agenda as well as to, subsequently, implement and assess strategic change. To that end, initial efforts may include:

- *determining the data elements required to provide a comprehensive picture of health, including social and societal determinants and consequences of health and the related aspects of economics, education, etc.;*[98]
- *identifying the available sources of information related to these data needs;*
- *collating the available data into a comprehensive Delta information dataset that is accurate, accessible, and user-friendly;*
- *identifying gaps in existing knowledge important to developing plans to improve health;*
- *developing strategies and proposals to acquire the needed but missing data elements; and*
- *developing access and dissemination strategies to facilitate and promote use of data in community improvement projects.*

These data sources would use counties (or smaller subunits, if available) as main unit of analysis so that aggregate data for the multistate region of the Delta can be developed, and would stratify data by gender, race, age, poverty status, and living arrangements. The dataset should be updated regularly, and be easily accessible by investigators (raw data) and other community stakeholders (aggregate data and automated query functions).[99] The result will be a comprehensive database of major health, economic, and related indicators for the Delta region that can be used by investigators for specific projects and by decision makers to develop, assess, and support program and policy initiatives.

[98] Navarro AM, Voetsch KP, Liburd LC, Giles HW, Collins JL. Charting the future of community health promotion: recommendations form the National Expert Panel on Community Health Promotion. Prev Chronic Dis 4:1, 2007.

[99] Such a database has been developed in Manitoba, Canada. See Roos NP. Establishing a population data-based policy unit. Med Care 37:JS15, 1999, for a full description.

C. DESCRIPTIVE ANALYSES OF THE HEALTH, HEALTH CARE, AND ECONOMIC CONDITIONS IN THE DELTA

The data sets described above may, initially, be used to develop basic descriptive analysis of the health and economic conditions of the Delta. These analyses would:

- *include analyses of direct measures of health and the determinants and consequences of current conditions;*
- *provide a detailed picture, including time trends and geographic patterns, of the important variables as described below;*
- *utilize both quantitative and qualitative data collection and research approaches, as appropriate;* and
- *utilize both analysis of original data and previously collected data, as appropriate*.

Basic analyses would include the characteristics of the Delta region related to health, economic development, and related issues, including:

- *population characteristics*, including age, race and ethnicity, income and poverty distributions, household descriptions, in- and out-migration, and population changes;
- *mortality rates and trends,* including analysis of infant and child mortality rates, adult survival rates, and major causes of death;
- *morbidity rates,* including analysis of disease prevalence data (direct and model-based), risk factor rates, and generic measures of health status (e.g., healthy life expectancy and quality of life);
- *economic well-being in the Delta,* including analysis of labor participation rates, employment and earnings, family and household income, employer size and sectors, migration, and personal and business bankruptcy rates and causes;
- *health care systems,* including analysis of:
  - ◊ available health care resources, including manpower, facilities and funding sources, public and private facilities and programs, and social service agencies;
  - ◊ spending on health care and finance mechanisms;
  - ◊ geographic distribution of health care resources and spending in relation to population and health conditions;
  - ◊ safety-net capabilities and utilization; and
  - ◊ health system utilization rates and trends.
- *patient related factors*, including patient satisfaction, consumer knowledge, attitudes, and practices, barriers to effective access to

needed services, and measures of financial risk posed by illness and health care use;

- *barriers to health care use,* including both communal and personal barriers;[100]
- *analyses of the public health systems,* including funding, manpower, services, and outcomes using methods of public health systems research;[101]
- *public policies,* including descriptions of state- and federal- policies that impact the region;
- *geography and transport,* including analysis of spatial distribution of health resources in relation to population centers and trends, and modes and cost of transport in relation to health care resources and population centers; and
- *qualitative descriptive analysis,* including interviews and focus groups of health providers and their clients, site visits, and meetings with business leaders and public policymakers.

Each of these analyses should include time trends, projections, and geographic relationships, as well as analyses of the Delta in relation to other regions of the nation to assess how the Delta region is faring relative to the rest of the U.S.

D. ANALYSIS OF CURRENT AND PAST IMPROVEMENT EFFORTS

Despite the attention that the issues of the Delta have received over several decades, conditions remain poor. Some key differences between the Delta and the overall nation are increasing. Hence, there is a need to examine past efforts at improvement to determine which program have been successful and which have not, and to also determine the characteristics of the successful programs that may be emulated and incorporated into new efforts.

This effort would include assessing the effectiveness of existing interventions based on pre-established criteria for success and include measures of economic and other cross-sectoral measures.

E. IDENTIFICATION OF IMPORTANT SUBSEQUENT ANALYSIS AND RESEARCH AND INTERVENTION ISSUES

The conditions in the Delta and the related discussions above suggest several possible, specific initial opportunities. These include:

- *developing of regional (as opposed to national or state) health accounts* to quantify sources and expenditures in the region, including,

[100] Davidson, *et al*., *ibid.*
[101] Mays GP, Halverson PK, Scutchfield FD. Behind the curve? What we know and need to learn from public health systems research. J Pub Health Manag Prac 9:179, 2003.

for example, sources of payment for uncompensated care, levels of out-of-pocket costs, etc.;

- *evaluating state health and economic development plans* for regional (both inter-state and intra-state regions) applicability;
- *expanding public health surveillance* to include social and societal determinants and consequences of health;
- *quantifying the relation between health and wealth* in the Mississippi River Delta, including the microeconomic, macroeconomic, and long-term economic benefits of good health;
- *quantifying the relation between educational achievement and health and wealth* in the Mississippi River Delta;
- *measuring the local economic impact of developing and operating health care services*, including the local economic impact of federal and state funds;
- *studying the role of healthy populations as an attractor for business investment*;
- *measuring the impact of localized industry expansion* (e.g., the casino industry or the relocation of an auto assembly plant) on local and regional health;
- *determining the relation between health care needs and health care resource allocations within and across states*;
- *measuring the relation between disparities* (cross-state, cross-race, cross-income, insurance status variations in access and treatment conditional) on health status; and
- *assessing the implications of local and regional demographic change* on labor force growth/decline, income per capita, and health care needs.

V. PUBLIC POLICY INTERVENTIONS AND STUDIES

Public policies can influence health by impacting the multiple determinants of health (Figure 2). They are perhaps the most important approach to widespread improvement in health. This impact may be either through direct governmental intervention or by facilitating private sector efforts. Conversely, inappropriate public policy may also be a major limiting factor in improvement, often because of the unintentional consequences of well-intentioned actions.

The WHO Commission on Social Determinants of Health has emphasized the importance of policy making and governance in health improvement.[102] They conclude that "nations that have high life expectancies and low infant mortality rates are also those where city government leaders and policies address the key social determinants of health". Among the public policies identified as important for health improvement are those that promote better housing and living

[102] WHO Commission on Social Determinants of Health. *Our Cities, Our Health, Our Future: Acting on Social Determinants of Health.* Kobe, Japan: WHO Centre for Health Development, 2007.

conditions, safer working environments and neighborhoods, food security, and access to services such as education, public transportation, and child care.

Public policies aimed at improving population health have not been widely developed in the United States, although they have been implemented in many Western nations.[103,104] Reasons for the lack of attention in this nation include the greater concern with tax reduction and shrinking government size than in health improvement that would likely involve taxation, resource redistribution, and regulation; resistance to the notion that the major determinants of health are unrelated to health care; and the complexity of the problem, as described above.[105]

Several arguments provide a compelling rationale for public policy in promoting public health. These include the basic theories underlying public health law, including preventing harm to others (e.g., banning smoking in public places), preventing harm to those unable to care for themselves (e.g., protection of minors), and (arguably) preventing people from harming themselves through easily avoidable and relatively nonintrusive regulations (e.g., requiring seat belt use).

Other arguments can be added. First, public policy intervention is warranted as a matter of social justice, that is, "the fair disbursement of common advantages and the sharing of common burdens" [106] that involves "the state having a role not only in the traditional areas of infectious disease and sanitation, but also in the emerging areas such as chronic diseases caused by diet, lifestyle, and the environment." Others have invoked legal theories to propose an affirmative legal obligation for public policy intervention to improve health. [107]

A more pragmatic rationale is that public policy interventions are critical in taking advantage of the role of health in economic development. Societal support of health care is warranted not only because of the communal and humanitarian responsibilities of government and societies to promote well-being, but because the macroeconomic consequences of health improvement are reaped by the community as a whole. Governmental support of health care becomes directly analogous to governmental support and subsidy of other forms of infrastructure development that promote community business and economic development.

Public policy interventions aimed at health improvement[108,109,110,111,112] fall into several categories. These include the following.

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[103] Lalonde M. *A New Perspective on the Health of Canadians*. Ottawa: Minister of Supply and Services, 1974.
[104] Acheson D. *Inequalities in Health: Report*. London: Her Majesty's Stationery Office, 1998.
[105] Low, *et al*., *op. cit.*
[106] Gostin LO, Powers M. What does social justice require for the public's health? Public health ethics and policy imperatives. Health Aff 25(4):1053, 2006.
[107] Ryan KW, Card-Higginson P, Thompson JW. Am I my brother's keeper? A proposal to determine state governments' affirmative duty to advance public health. J Health Human Serv Admin 31:124, 2008.
[108] Acheson, *op. cit.*

- *Policies that alter the scope and emphasis of the overall policy program.* This includes, as examples,
  - providing leadership that informs and motivates change;
  - advocating, promoting, and mandating intersectoral policies to improve health, with the involvement of multiple governmental agencies and private organizations;
  - policies and procedures that promote cooperation and coordination among the various governmental, private, and academic organizations;
  - developing interstate, regional mechanisms for health planning, resource allocation, and coordination of issues, such as differences in Medicaid policies in adjacent Delta states, in health professional licensure (including foreign doctors), in certificate of need requirements; and in development of state health and economic development plans;
  - requiring that all policies, including those related to economic and education programs, be examined for possible impacts on health and its determinants;
  - establishing state-level health plans and allocation systems that recognize and reflect the intrastate differences in health needs;
  - requiring outcome assessments of all interventions, based on pre-existing criteria and benchmarks;
  - enhancing monitoring and reporting of health-related data;
  - providing economic incentives that facilitate change; and
  - strengthening the science base for evidence-based policy making, including establishing ongoing data collection, analysis, and information dissemination systems to provide up to date and reliable information to policy and decision makers.
- *Policies that promote sociostructural improvement.* This includes, as examples, policies that
  - address social and societal determinants of health in addition to health care;
  - recognize the social and societal factors that influence personal behaviors and that recognize the distinction between “victims” and “sinners” in aspects of health and health care;
  - reduce poverty and income inequality;
  - increase employment and earnings through job training, minimum wages, and other employment policies;

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[109] Tarlov A. Public policy frameworks for improving population health. Ann NY Acad Sci 896:281, 1999.
[110] Adler NE, Newman K. Socioeconomic disparities in health: pathways and policies. Health Aff 21(2):80, 2002.
[111] Lurie N. What the federal government can do about nonmedical determinants of health. Health Aff 21(2):94, 2002.
[112] McGinnis, *et al*., *op. cit.*

    - improve housing conditions through expanded inspections and enforcement and expanding support for renovation;
    - improve transportation by expanding public systems, reducing speed limits, and promoting opportunities for safe walking and cycling;
    - reduce environmental pollution by standards enforcement and zoning regulation; and
    - improve childhood and adult nutrition by regulating the availability and affordability of healthy food in neighborhoods and in schools and by examining overall agricultural policies.

- *Policies that focus on the disadvantaged*, including the poor, mothers and young children, and minorities, that is, policies that form a "pro-poor" policy approach, [113] including the
    - reallocation of resources and services by targeting the poor and other vulnerable groups;
    - concentrating resources and attention on the diseases and conditions of the poor;
    - reducing the barriers facing the poor in accessing programs, including reducing the burden of out-of-pocket payments; and
    - improving the supply and effectiveness of community-oriented public health services.

- *Policies that directly impact health care services*, including:
    - promoting access to care;
    - improving quality of care; and
    - reducing the financial burden of care and the financial consequences of illness by expanding public insurance coverage and changes in insurance regulation.

Special attention to the critical role of early childhood education in promoting population health is warranted. As noted by Adler and Newman,[114] when policymakers debate the value of increasing education, they generally do not include the value of the resulting health improvements. Appropriately timed and targeted interventions, including Head Start programs, have been shown to improve cognitive capacity of at-risk children at the pre-kindergarten level.[115]

Elements of an effective policy program aimed at improving educational achievement have been suggested.[116] These include:

- assuring an adequate minimum of prenatal care;
- providing parental training and support;

[113] World Health Organization Regional Office for the Eastern Mediterranean. *Investing in Health of the Poor. A Strategy for Sustainable Health Development and Poverty Reduction in the Eastern Mediterranean Region.* Cairo: World Health Organization, 2004.
[114] Adler & Newman, *op. cit.*
[115] Low, *et al*., *op.cit.*
[116] Low, *et al*., *ibid*.

- providing quality child care;
- progressive introduction of basic education beginning in infancy; and
- requiring regular assessment of developmental milestones through, for example, expansion and monitoring of Early Periodic Screening, Diagnosis and Treatment (EPSDT) programs.

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